

**ARTICLE OF APPAREL FOR TEMPERATURE MODERATION****BACKGROUND OF THE INVENTION****Field of the Invention**

- [01] The present invention relates to apparel for moderating the body temperature of an individual. The invention concerns, more particularly, an article of apparel for athletic activities or medical applications that receives thermal inserts for decreasing or increasing the body temperature.

**Description of Background Art**

- [02] The body temperature of an individual affects the athletic performance of the individual when engaging in athletic activities. Components of the body temperature include core temperature and surface temperature, for example. Whereas the core temperature is associated with interior portions of the individual (i.e., the internal organs), the surface temperature is a measure of the temperature associated with the surface of the individual (i.e., the skin). Although the core temperature and surface temperature are discrete measurements and may vary significantly, the core temperature has an effect upon the surface temperature. Similarly, the surface temperature has a corresponding effect upon the core temperature.
- [03] As the individual begins engaging in an athletic activity, such as practice sessions or competitions, the core temperature of the individual may rise as the level of athletic activity increases, particularly in relatively hot climates. Although a rise in core temperature is a normal aspect of engaging in athletic activities, the athletic performance level of the individual begins to decrease once the body temperature increases above a threshold temperature that may vary for different individuals. For some individuals, for

example, the threshold temperature may be approximately 39 degrees Celsius (i.e., 102 degrees Fahrenheit). Accordingly, moderating or otherwise delaying a rise in the core temperature during an athletic activity reduces heat stress and may increase the overall athletic performance level of the individual.

#### SUMMARY OF THE INVENTION

- [04] The present invention is an article of apparel for moderating the body temperature of an individual. The article of apparel may have the configuration of a vest that includes a torso region and a plurality of cavities distributed throughout the torso region. The torso region covers at least a portion of a torso of the individual and includes a chest area, a back area, and a pair of side areas. The cavities are positioned in each of the chest area, the back area, and the side areas.
- [05] In one aspect of the invention, a plurality of thermal inserts are positionable in the cavities. The thermal inserts may be bladders that enclose a fluid, such as water. The thermal inserts may have at least two chambers, each of the chambers including a portion of the fluid. The article of apparel may also include a fitting system extending at least partially around the torso region to form-fit or otherwise ensure contact between the chest area, the back area, and the side areas against the torso of the individual. The article of apparel may also include a pair of shoulder areas corresponding with shoulders of the individual, and the shoulder areas may include cavities for receiving some of the thermal inserts.
- [06] In another aspect of the invention, the article of apparel may include instructions for utilizing the article of apparel. The instructions may be permanently secured to the article of apparel, such as on an interior surface. In addition, the instructions may be pictorial representations for utilizing the article of apparel.

- [07] The advantages and features of novelty characterizing the present invention are pointed out with particularity in the appended claims. To gain an improved understanding of the advantages and features of novelty, however, reference may be made to the following descriptive matter and accompanying drawings that describe and illustrate various embodiments and concepts related to the invention.

#### DESCRIPTION OF THE DRAWINGS

- [08] The foregoing Summary of the Invention, as well as the following Detailed Description of the Invention, will be better understood when read in conjunction with the accompanying drawings.
- [09] Figure 1 is a front elevational view of an article of apparel for temperature moderation within the scope of the present invention.
- [10] Figure 2 is a back elevational view of the article of apparel.
- [11] Figure 3 is an exploded front elevational view of the article of apparel.
- [12] Figure 4 is an exploded back elevational view of the article of apparel.
- [13] Figure 5 is a cross-sectional view of an insert for the article of apparel, as defined by section line 5-5 in Figure 4.
- [14] Figure 6 is a front elevational view of the article of apparel showing a portion of an interior surface of the article of apparel.
- [15] Figure 7 is a first schematic plan view of instructions associated with the article of apparel.
- [16] Figure 8 is a second schematic plan view of instructions associated with the article of

apparel.

#### DETAILED DESCRIPTION OF THE INVENTION

- [17] The following discussion and accompanying figures disclose an article of apparel 10 for moderating the body temperature (i.e., at least one of the core temperature and the surface temperature) of an individual. Apparel 10 is disclosed as having the configuration of a vest that covers a torso of the individual, but may also have the configuration of a shirt or jacket, for example, that covers arms of the individual. Various concepts associated with apparel 10 may also be incorporated into other types of apparel, including pants, shorts, headwear, and footwear, for example. Accordingly, the vest configuration of apparel 10 is intended to provide an example of the plurality of apparel configurations within the scope of the present invention.
- [18] As depicted in Figures 1-4, apparel 10 includes a vest member 20 that defines a plurality of cavities 31-35, a plurality of thermal inserts 41-45 that are positionable within cavities 31-35, and a fitting system 50. As described in greater detail in the following material, the individual wears apparel 10 such that vest member 20 extends around the torso, thermal inserts 41-45 are positioned within cavities 31-35, and fitting system 50 effectively ensures that apparel 10 contacts the individual. When thermal inserts 41-45 exhibit an appropriate temperature, apparel 10 may be utilized to moderate the body temperature of the individual.
- [19] Apparel 10 has application to athletic activities and medical applications, for example. With regard to athletic activities, such as competitions or practice sessions, apparel 10 may be utilized to reduce the body temperature of the individual. More particularly, thermal inserts 41-45 may be refrigerated or otherwise cooled in order to reduce the body temperature of the individual prior to engaging in the athletic activity. If utilized in the

context of medical applications, however, thermal inserts 41-45 may be heated or cooled in order to promote a corresponding change in the body temperature of the individual. Accordingly, the specific manner in which apparel 10 is utilized to moderate the body temperature of the individual may vary depending upon the context of use and the desired change in body temperature. For purposes of the following discussion, however, apparel 10 will be discussed in relation to athletic activities.

**[20]** Vest member 20 is formed from various material elements that define a chest area 21 corresponding with a chest of the individual, a back area 22 corresponding with a back of the individual, a pair of side areas 23 corresponding with sides of the individual, and a pair of shoulder areas 24 corresponding with shoulders of the individual. Vest member 20 also includes a pair of arm openings 25 and a closable access opening 26. As discussed above, apparel 10 has the configuration of a vest that covers the torso of the individual. Accordingly, areas 21-24 and arm openings 25 impart the general configuration of a vest to substantially cover the torso of the individual while leaving the arms uncovered. In addition, access opening 26 permits the individual to don and remove apparel 10 with relative efficiency.

**[21]** Areas 21-24 are not intended to demarcate specific portions of apparel 10 or vest member 20. Rather, areas 21-24 are intended to generally define portions of apparel 10 and vest member 20 for purposes of reference in the following discussion. As depicted in the figures, chest area 21 exhibits a configuration that extends from a neck of the individual to a waist of the individual. Similarly, back area 22 exhibits a configuration that extends from the neck to the waist. Side areas 23 are positioned between areas 21 and 22 and exhibit a configuration that extends from the arms to the waist. Shoulder areas 24 are also positioned between areas 21 and 22 and exhibit a configuration that extends over the shoulders. In some embodiments, areas 21-24 may have different configurations that cover different portions of the individual. For example, areas 21 and 22 may exhibit a

longer configuration that covers portions of the individual below the waist. Accordingly, areas 21-24 define generally-located portions of apparel 10 and vest member 20 for purposes of discussion.

[22] Arm openings 25 are apertures in vest member 20 that are formed by one or more edges of areas 21-24. When apparel 10 is worn, the arms of the individual extend through arm openings 25 and are exposed. Access opening 26 extends in a substantially vertical direction through chest area 21 and includes a zipper that selectively separates and joins opposite sides of chest area 21. Other closure devices may be utilized in place of the zipper, including a magnetic system or a hook-and-loop system, for example. The location of access opening 26 may vary. For example, access opening 26 may be oriented differently, extend through a different portion of chest area 21, or extend through back area 22.

[23] As discussed above, vest member 20 is formed from various material elements that define chest area 21, back area 22, side areas 23, and shoulder areas 24. The material elements also define cavities 31-35. Vest member 20 may be formed from two superimposed layers of material, or vest member 20 may be formed from a plurality of material elements that are sewn or otherwise joined together. In either scenario, however, vest member 20 generally includes an outer material layer 27 and an inner material layer 28, with cavities 31-35 being formed between layers 27 and 28. Accordingly, cavities 31-35 are formed between the various material elements of vest member 20. Cavities 31-35 may be sewn or otherwise sealed such that thermal inserts 41-45 are permanently located therein. As depicted in the figures, however, cavities 31-35 form a pocket with an upper opening that receives thermal inserts 41-45, and thermal inserts 41-45 may be selectively removed from cavities 31-35. The manner in which vest member 20 forms the various cavities 31-35 may, therefore, vary significantly within the scope of the present invention.

[24] Each of cavities 31-35 exhibit a generally elongate, vertical configuration. The dimensions of cavities 31-35 vary, however, depending upon the specific locations of cavities 31-35 with respect to vest member 20. For example, vest member 20 defines six cavities 31 positioned in a lower portion of chest area 21, a lower portion of back area 22, and a lower portion of side areas 23. Cavities 31 exhibit a length that extends through approximately one-half of the height of vest member 20, and cavities 31 exhibit a relatively wide width. Vest member 20 also defines six cavities 32 that are positioned in upper portions of areas 21 and 22, and also positioned to extend through shoulder areas 24. Cavities 32 exhibit a lesser height than cavities 31, but have a width that is substantially similar to the width of cavities 31. Four cavities 33 are centrally-positioned in the lower portion of back area 22. Cavities 33 are parallel to adjacent cavities 31 and exhibit the same height as cavities 31. The width of cavities 33, however, is substantially less than the width of cavities 31. Vest member 20 also defines two cavities 34 that are centrally-positioned in the upper portion of back area 22. In comparison with cavities 33, cavities 34 exhibit a greater height. In addition, two relatively small cavities 35 are positioned in chest area 21 and adjacent to arm openings 25.

[25] The relative number, dimensions, and positions of cavities 31-35 discussed above provides a configuration for vest member 20 in which cavities 31-35 cover a substantial portion of the torso. That is, the distribution of the various cavities 31-35 formed in vest member 20 is selected to cover a substantial portion of the torso. In further embodiments of the invention, the relative number, dimensions, and positions of cavities 31-35 may be significantly different. Accordingly, the distribution of cavities 31-35 discussed above is intended to represent one possible configuration for apparel 10.

[26] Thermal inserts 41-45 are positionable within cavities 31-35. More particularly, apparel 10 includes six thermal inserts 41 that exhibit the approximate dimensions of cavities 31, and thermal inserts 41 may be positioned within cavities 31. Similarly, apparel 10

includes six thermal inserts 42, four thermal inserts 43, two thermal inserts 44, and two thermal inserts 45 with the approximate dimensions of cavities 32-35, respectively. The various thermal inserts 42-45 may also be positioned in the respective cavities 32-35.

- [27] The structure and composition of thermal inserts 41-45 may vary significantly within the scope of the present invention. Referring to Figure 5, insert 41 is depicted as being a bladder 46 in which water 47 is sealed. More particularly, bladder 46 includes a peripheral seal 48 and a medial seal 49. Peripheral seal 48 seals the periphery of bladder 46 in order to prevent water 47 from escaping. Medial seal 49 extends through a central area of insert 41 and effectively forms two chambers within insert 41. An advantage of the two chambers is that water 47 is restrained from collecting in a lower portion of insert 41. That is, medial seal 49 ensures that water 47 remains distributed throughout insert 41. In further embodiments, multiple medial seals may be utilized to form additional chambers.
- [28] For purposes of athletic activities, cooling thermal inserts 41-45 below zero degrees Celsius (i.e., 32 degrees Fahrenheit) provides an appropriate degree of cooling in the individual. Accordingly, the individual may utilize the degree of freezing in water 47 as a gauge for determining when thermal inserts 41-45 are properly cooled. A variety of other materials may also be utilized in place of water 47, including a saline solution, glycerin, or a paraffin solution (e.g., phase-change material), for example. In addition to liquids, various gels or solid materials may also be utilized for thermal inserts 41-45. Accordingly, thermal inserts 41-45 may be formed from one or more materials that may be cooled and utilized to moderate the body temperature of the individual.
- [29] Fitting system 50 includes a pair of straps 51 and a pair of connectors 52. Straps 51 extend at least partially around chest area 21, back area 22, and side areas 23 to at least partially encircle the torso of the individual. In addition, straps 51 may extend though



various loops formed in vest member 20. Connectors 52 are located on ends of straps 51 and join the ends together in a manner that ensures contact between the individual and chest area 21, back area 22, and side areas 23. Straps 51 may be formed of a woven polymer webbing, and connectors 52 may be d-rings, as depicted in the figures. Alternately, a variety of other structures may be utilized for either straps 51 or connectors 52. For example, connectors 52 may each include two portions that join together and are positioned adjacent opposite ends of straps 51.

[30] Apparel 10 is worn such that vest member 20 extends around the torso, thermal inserts 41-45 are positioned within cavities 31-35, and fitting system 50 effectively ensures that apparel 10 is form-fit or otherwise contacts the individual. When thermal inserts 41-45 exhibit an appropriate temperature, apparel 10 may be utilized to moderate the body temperature of the individual. With regard to athletic activities, thermal inserts 41-45 may be refrigerated or otherwise cooled in order to reduce the body temperature of the individual prior to engaging in the athletic activities. In order to ensure that the individual properly cools thermal inserts 41-45, engages in suitable activities prior to the athletic activities, and wears apparel 10 for a proper period of time, a set of instructions 60 may be provided with apparel 10.

[31] Instructions 60 may be permanently secured to a portion of apparel 10 in order to ensure that instructions 60 are available to the individual at the time of use. More particularly, instructions 60 may be one or more elements of material that are stitched or bonded to an interior surface of apparel 10. As depicted in Figure 6, instructions 60 include two panels 61 and 62 that include text or pictorial representations that provide directions for utilizing apparel 10. As alternatives for panels 61 and 62, instructions 60 may be printed on the interior surface or on the exterior surface, or instructions 60 may be a tag that is secured to apparel 10.

- [32] The manner of utilizing apparel 10 is outlined in Figures 7 and 8, which depicts panels 61 and 62 of instructions 60. Panels 61 and 62 each include two pictorial representations of the manner in which apparel 10 is intended to be utilized. Panel 61 depicts a first step and a second step of the instructions, and panel 62 depicts a third step and a fourth step of the instructions. Regarding the first step, apparel 10 or thermal inserts 41-45 are cooled for approximately twenty-four hours with a refrigeration device, such as a refrigerator, to below zero degrees Celsius (i.e., 32 degrees Fahrenheit). This ensures that thermal inserts 41-45 are at the proper temperature prior to the use of apparel 10. In the second step, the individual dons apparel 10 and remains in a relatively motionless or sedentary state for approximately 30 minutes. Regarding the third step, the individual may perform stretching or warm-up activities for approximately 30 minutes prior to the athletic activities. Accordingly, the individual engages in a sedentary activity during the second step, the individual engages in non-sedentary activities during the third step. As the fourth step, the individual removes apparel 10 and engages in the athletic activities. In addition, the apparel may don apparel 10 during breaks in the athletic activity and during recovery.
- [33] Wearing apparel 10, as in the second and third steps discussed above, lowers the overall body temperature of the individual. More particularly, wearing apparel 10 places the individual in contact with apparel 10 and heat from the individual is conducted to thermal inserts 41-45. If, for example, thermal inserts 41-45 are too cold (e.g., below zero degrees Fahrenheit) then the individual may risk thermal injury, such as frost-bite. Accordingly, utilizing a proper temperature (e.g., below 32 degrees Fahrenheit, but not as low as zero degrees Fahrenheit) provides apparel 10 with greater degree of effectiveness and safety.
- [34] The distribution of thermal inserts 41-45 is selected to cover a significant portion of the torso. Experimental analysis indicates, however, that additional cooling of the sides of

the individual plays a significant part in lowering the overall body temperature of the individual. Accordingly, apparel 10 is structured to cover the sides and include thermal inserts 41 in side areas 23. In order to ensure that apparel 10 properly contacts the individual, thereby permitting conduction to occur between the individual and thermal inserts 41-45, fitting system 50 is utilized. That is, fitting system 50 ensures that proper contact is made between individual and apparel 10.

[35] Based upon the above discussion, apparel 10 may be utilized for moderating the body temperature of an individual prior to athletic activities or during medical applications. Vest member 20 defines the various cavities 31-35 and thermal inserts 41-45 are positionable within cavities 31-35. Fitting system 50 ensures that proper contact is made between individual and apparel 10, and instructions 60 provide guidance on the proper manner of utilizing apparel 10. Apparel 10 covers the torso of the individual, including the sides. Although apparel 10 is disclosed as having the configuration of a vest, other types of apparel may also incorporate the concepts discussed above.

[36] The present invention is disclosed above and in the accompanying drawings with reference to a variety of embodiments. The purpose served by the disclosure, however, is to provide an example of the various features and concepts related to the invention, not to limit the scope of the invention. One skilled in the relevant art will recognize that numerous variations and modifications may be made to the embodiments described above without departing from the scope of the present invention, as defined by the appended claims.